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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/652,284 | 08/31/2000 | Vi-En Choong | MBHB00-025 | 2923 |

7590 03/13/2002

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| EXAMINER |
|---|
| TRAN, MY CHAU T |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1641 | |

DATE MAILED: 03/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/652,284 | CHOONG ET AL. | |
| | Examiner | Art Unit | |
| | My-Chau T. Tran | 1641 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *29 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-75* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-75* is/are rejected.

7)☒ Claim(s) *3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 August 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election with traverse of Group I, Claims 1, 3, 5-48, and 61-75, in Paper No. 5 is acknowledged. The traversal is on the ground(s) that Group II, Claims 2, 4, 5-75, is directed to the same apparatus as Group I. The feature a reference electrode in Group II does not distinguish Group II from Group I as an independent and distinct invention, but rather an added limitation. This is found persuasive. Therefore, the restriction requirement is modified to the extent that Group II now rejoined with Group I. Group I now includes claim 1-75.

### *Claim Objections*

2. Claim 3 is objected to because of the following informalities: Claim 3 has listed features (a)-(f) and (h)-(i), but feature (g) is not listed. Therefore, it is unclear if (g) is missing part or that the features are incorrectly numbered. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 64-75 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 64 is unclear whether it is an independent method claim or a method that depend on the apparatus of either Claim 1, 2, 3, or 4.

Claim 65 is an improper Markush group. The steady-state measurement method is totally embraced within the transient measurement group.

The acronym "AC" of claims 65-68 is not defined in the claim so that those who are ordinary skills in the art would know applicant intended meaning.

In Claim 67, the acronym "DC" is not defined in the claim so that those who are ordinary skills in the art would know applicant intended meaning.

Claims 65-75 depend from rejected claim 64 and include all the limitation of claim 64 thereby rendering these dependent claims indefinite.

### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims 1-2, 6-30, 33-46, 48-51 and 53-75 rejected under 35 U.S.C. 102(e) as being anticipated by Kayyem et al (US Patent 6,290,839 B1).

Kayyem et al. discloses an apparatus for electrical or electrochemical detection of molecular interactions in a sample solution (abstract; col. 2, line 26-36). The apparatus comprise of a supporting substrate (fig. 1C, ref. #30; col. 2, line 42), a plurality of porous, polymeric pads

(fig. 1C, ref. #25; col. 2, line 28-29 and 49-50; col. 8, line 41-54), and a set of electrodes in contact with a plurality of porous, polymeric pads (fig. 1 (A-D), ref. #10 and 20; col. 2, line 28-29 and 42-43; col. 8, line 31-41). The electrodes are arranged to address a subset of test sites (fig. 1 (A-F); col. 2, line 40-42). Each output electrode is in electrochemical contact with an input electrode (col. 2, line 33-37). The linker (ref. #106, fig. 3A) is in contact with the polymeric pads (ref. #107, fig. 3A) and the probe molecules (ref. #100, fig. 3A) immobilized to the linker (col. 3, line 1-5; col. 6, line 4-13 and 39-46; col. 65, line 50-57). The apparatus further comprise of a reference electrode, a means for producing an electrical signal, a means for detecting changes in the electrical signal (col. 65, line 66-67 and continue to col. 66, line 1-9), and an electrolyte solution in contact with the polymeric pads (col. 2, line 27-31; col. 11, line 1-2). The molecular interactions between the immobilized probe molecules and target molecules are detected (col. 1, line 61-67 and continue to col. 2, line 1-2). The preferred electrodes are known in the art and include gold and platinum, which are known as conductive material (col. 8, line 7-17). It is also known in the art that electrodes are also comprise of an insulating material such as glass and the insulating material is the supporting substrate (col. 58, line 6-13; fig. 1 (A-E), ref. #30). The linker moieties comprise of thiol linkers (col. 23, line 12-13; col. 25, line 3-20). The probe molecules are nucleic acids or peptides (col. 23, line 66-67 and continue to col. 24, line 1-5 and 26-65). The probes are covalently attached to the linker and are in contact with the electrode (col. 21, line 26-29).

Kayyem et al. further teaches the method for electrical detection that includes cyclic voltammetry (Abstract; col. 68, line 55-67 and continue to col. 69, line 1-5). The method steps are applying and detecting the first electrical signal, exposing the sample mixture containing the

target molecule, applying and detecting a second electrical signal, comparing and determining the difference of the first and second electrical signal (col. 9, line 34-52; col. 74, line 58-61).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 3-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kayyem et al (US Patent 6,290,839 B1) in view of Roberts et al. (US Patent 5,958,791).

Kayyem et al. discloses an apparatus for electrical or electrochemical detection of molecular interactions in a sample solution (abstract; col. 2, line 26-36). The apparatus comprise of a supporting substrate (fig. 1C, ref. #30; col. 2, line 42), a plurality of porous, polymeric pads (fig. 1C, ref. #25; col. 2, line 28-29 and 49-50; col. 8, line 41-54), and a set of electrodes in contact with a plurality of porous, polymeric pads (fig. 1 (A-D), ref. #10 and 20; col. 2, line 28-29 and 42-43; col. 8, line 31-41). The electrodes are arranged to address a subset of test sites (fig. 1 (A-F); col. 2, line 40-42). Each output electrode is in electrochemical contact with an input electrode (col. 2, line 33-37). The linker (ref. #106, fig. 3A) is in contact with the polymeric pads (ref. #107, fig. 3A) and the probe molecules (ref. #100, fig. 3A) immobilized to the linker (col. 3, line 1-5; col. 6, line 4-13 and 39-46; col. 65, line 50-57). The apparatus further comprise of a reference electrode, a means for producing an electrical signal, a means for detecting changes in the electrical signal (col. 65, line 66-67 and continue to col. 66, line 1-9), and an electrolyte solution in contact with the polymeric pads (col. 2, line 27-31; col. 11, line 1-2). The molecular interactions between the immobilized probe molecules and target molecules are detected (col. 1, line 61-67 and continue to col. 2, line 1-2). The preferred electrodes are known in the art and include gold and platinum, which are known as conductive material (col. 8, line 7-17). It is also known in the art that electrodes are also comprise of an insulating material such as glass and the insulating material is the supporting substrate (col. 58, line 6-13; fig. 1 (A-E), ref. #30). The linker moieties comprise of thiol linkers (col. 23, line 12-13; col. 25, line 3-20). The probe molecules are nucleic acids or peptides (col. 23, line 66-67 and continue to col.

24, line 1-5 and 26-65). The probes are covalently attached to the linker and are in contact with the electrode (col. 21, line 26-29).

Kayyem et al. further teaches the method for electrical detection that includes cyclic voltammetry (Abstract; col. 68, line 55-67 and continue to col. 69, line 1-5). The method steps are applying and detecting the first electrical signal, exposing the sample mixture containing the target molecule, applying and detecting a second electrical signal, comparing and determining the difference of the first and second electrical signal (col. 9, line 34-52; col. 74, line 58-61).

The apparatus of Kayyem et al. differs from the claimed invention in failing to disclose that the output and input electrodes are interdigitated.

Roberts et al. discloses an apparatus that the output and input electrodes are interdigitated (Abstract; col. 6, line 10-13; col. 7, line 66-67 and continue to col. 8, line 1). Roberts et al. also teaches that the reference electrode is comprised of silver/silver chloride (col. 23, line 17-18 and claims 15 and 40). The support substrate comprises ceramic (col. 18, line 12-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Kayyem et al. by interdigitating the output and input electrodes as taught by Roberts et al. for the advantage of increasing signal detection such as increasing signal-to-noise ratio and decreasing ohmic signal losses (col. 8, line 2-10). The feature of interdigitation of the microelectrodes constitutes obvious variations in parameters that are routinely modified in the art. The art (Robert et al., col. 8, line 2-37) has shown that microelectrodes fabricated in an interdigitated array have inherent advantages in signal detection over more conventional electrode configurations.

The features of the dependent claims are either specifically described by the reference (e.g. streptavidin/biotinylated or ferrocene) or constitute obvious variations in parameters which are routinely modified in the art (e.g. choice of particular probe or detection device) and which have not been described as critical to the practice of the invention.

11. Claims 1-63 rejected under 35 U.S.C. 103(a) as being unpatentable over Sosnowski et al. (US Patent 6,051,380) in view of Roberts et al. (US Patent 5,958,791).

Sosnowski et al. teaches an apparatus for electrical or electrochemical detection of molecular interactions in a sample solution (Abstract; col. 7, line 13-20). The apparatus comprise of a supporting substrate (fig. 1), a plurality of porous, polymeric pads (fig. 2, ref. #22; col. 21, line 54), and a set of electrodes in contact with a plurality of porous, polymeric pads (fig. 1 and 2, ref. #12; col. 9, line 41-48; col. 21, line 37-40). The electrodes are comprised of a conductive material and insulating material (col. 21, line 42-48). The electrodes are arranged to address a subset of test sites (fig. 3). Each output electrode is in electrochemical contact with an input electrode (col. 29, line 13-25). The polymeric pads comprise of polyacrylamide gel (col. 25, line 56-63). An electrolyte solution is in contact with the polymeric pads (col. 15, line 47-55; col. 38, line 46-50). The linker is in contact with the polymeric pads and the probe molecules immobilized to the linker (fig. 4 and 19; col. 30, line 34-36). The apparatus further comprise of a means for producing an electrical signal, a means for detecting changes in the electrical signal (col. 33. line 26-42). The molecular interactions between the immobilized probe molecules and target molecules are detected (col. 7, line 61-67 and continue to col. 8, line 1-8). The probe

molecules are nucleic acids or peptides (col. 9, line 14-32). The probes are covalently attached to the linker and are in contact with the electrode (fig. 19).

The apparatus of Sosnowski et al. differs from the claimed invention in failing to disclose that the output and input electrodes are interdigitated.

Roberts et al. discloses an apparatus that the output and input electrodes are interdigitated (Abstract; col. 6, line 10-13; col. 7, line 66-67 and continue to col. 8, line 1). Roberts et al. also teaches that the reference electrode is comprised of silver/silver chloride (col. 23, line 17-18 and claims 15 and 40). The support substrate comprises ceramic (col. 18, line 12-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Sosnowski et al. by interdigitating the output and input electrodes as taught by Roberts et al. for the advantage of increasing signal detection such as increasing signal-to-noise ratio and decreasing ohmic signal losses (col. 8, line 2-10). The feature of interdigitation of the microelectrodes constitutes obvious variations in parameters that are routinely modified in the art. The art (Robert et al., col. 8, line 2-37) has shown that microelectrodes fabricated in an interdigitated array have inherent advantages in signal detection over more conventional electrode configurations.

The features of the dependent claims are either specifically described by the reference (e.g. streptavidin/biotinylated or ferrocene) or constitute obvious variations in parameters which are routinely modified in the art (e.g. choice of particular probe or detection device) and which have not been described as critical to the practice of the invention.

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following prior art teaches a microelectrode: Marks et al. (US Patent 6,203,758 B1), Chiu et al. (US Patent 5,412,499), and Eckhardt et al. (US Patent 6,127,127).

The following prior art teaches detection method using electrochemistry: Cranfield University (EP 0859230 A1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to My-Chau T. Tran whose telephone number is 703-305-6999. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long V. Le can be reached on 703-305-3399. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-4242 for regular communications and 703-872-9307 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0196.

mct
March 11, 2002